

### SCH4U - Lewis Structures Worksheet 2 – Polyatomic ions

After carefully reviewing the rules for drawing Lewis Structures, complete the structures for each of the following molecules.

Molecule	Total number of valence electrons	Skeleton of Lewis structure and valence e <sup>-</sup> on surrounding atoms	Number of valence electrons left	Lewis structure
NO <sub>2</sub> <sup>-</sup>	N: 5 v.e O: 6 v.e Total: 5 + 2×6 + 1 = <u>18</u>	: $\ddot{\text{O}}$ — N — $\ddot{\text{O}}$ :	18 - 16 = <u>2</u>	$\left[ :\ddot{\text{O}} - \ddot{\text{N}} = \ddot{\text{O}} : \right]^{-}$
HCO <sub>3</sub> <sup>-</sup>	H: 1 v.e C: 4 v.e O: 3 v.e Total: 1 + 4 + 3×6 + 1 = <u>24</u>	: $\ddot{\text{O}}$ — C — $\ddot{\text{O}}$ — H   : $\ddot{\text{O}}$ :	24 - 24 = <u>0</u>	$\left[ :\ddot{\text{O}} - \overset{\overset{:\ddot{\text{O}}:}{\parallel}}{\text{C}} - \ddot{\text{O}} - \text{H} : \right]^{-}$
SCN <sup>-</sup>	S: 6 v.e C: 4 v.e N: 5 v.e Total: 6 + 4 + 5 + 1 = <u>16</u>	: $\ddot{\text{S}}$ — C — $\ddot{\text{N}}$ :	16 - 16 = <u>0</u>	$\left[ :\ddot{\text{S}} = \text{C} = \ddot{\text{N}} : \right]^{-}$
HPO <sub>4</sub> <sup>2-</sup>	H: 1 v.e P: 5 v.e O: 6 v.e Total: 1 + 5 + 4×6 + 2 = <u>32</u>	: $\ddot{\text{O}}$ — P — $\ddot{\text{O}}$ — H   : $\ddot{\text{O}}$ :	32 - 32 = <u>0</u>	$\left[ :\ddot{\text{O}} - \overset{\overset{:\ddot{\text{O}}:}{\parallel}}{\text{P}} - \ddot{\text{O}} - \text{H} : \right]^{2-}$
PO <sub>3</sub> <sup>3-</sup>	P: 5 v.e O: 6 v.e Total: 5 + 3×6 + 3 = <u>26</u>	: $\ddot{\text{O}}$ — P — $\ddot{\text{O}}$ :   : $\ddot{\text{O}}$ :	26 - 24 = <u>2</u>	$\left[ :\ddot{\text{O}} - \overset{\overset{:\ddot{\text{O}}:}{\parallel}}{\text{P}} - \ddot{\text{O}} : \right]^{-}$

$\text{N}_3^-$	<p>N: 5 v.e<sup>-</sup></p> <p>Total: <math>3 \times 5 + 1 = \underline{\underline{16}}</math></p>	$:\ddot{\text{N}} - \text{N} - \ddot{\text{N}}:$	$16 - 16 = \underline{\underline{0}}$	$\left[ \ddot{\text{N}} = \text{N} = \ddot{\text{N}} \right]^-$
$\text{ClO}^-$	<p>Cl: 7 v.e<sup>-</sup></p> <p>O: 6 v.e<sup>-</sup></p> <p>Total: <math>7 + 6 + 1 = \underline{\underline{14}}</math></p>	$:\ddot{\text{Cl}} - \text{O}$	$14 - 8 = \underline{\underline{6}}$	$\left[ :\ddot{\text{Cl}} - \ddot{\text{O}}: \right]^-$
$\text{O}_2^{2-}$	<p>O: 6 v.e<sup>-</sup></p> <p>Total: <math>2 \times 6 + 2 = \underline{\underline{14}}</math></p>	$\text{O} - \ddot{\text{O}}:$	$14 - 8 = \underline{\underline{6}}$	$\left[ :\ddot{\text{O}} - \ddot{\text{O}}: \right]^{2-}$
$\text{H}_3\text{O}^+$	<p>H: 1 v.e<sup>-</sup></p> <p>O: 6 v.e<sup>-</sup></p> <p>Total: <math>3 \times 1 + 6 - 1 = \underline{\underline{8}}</math></p>	$\begin{array}{c} \text{H} - \text{O} - \text{H} \\   \\ \text{H} \end{array}$	$8 - 6 = \underline{\underline{2}}$	$\left[ \begin{array}{c} \text{H} - \ddot{\text{O}} - \text{H} \\   \\ \text{H} \end{array} \right]^+$
$\text{NH}_4^+$	<p>N: 5 v.e<sup>-</sup></p> <p>H: 1 v.e<sup>-</sup></p> <p>Total: <math>5 + 4 \times 1 - 1 = \underline{\underline{8}}</math></p>	$\begin{array}{c} \text{H} \\   \\ \text{H} - \text{N} - \text{H} \\   \\ \text{H} \end{array}$	$8 - 8 = \underline{\underline{0}}$	$\left[ \begin{array}{c} \text{H} \\   \\ \text{H} - \text{N} - \text{H} \\   \\ \text{H} \end{array} \right]^+$